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10/587,971	03/05/2007	Masashi Tsuboi	294569US8PCT	7115

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EXAMINER	
PERROMAT, CARLOS	

ART UNIT	PAPER NUMBER
2628	

NOTIFICATION DATE	DELIVERY MODE
03/29/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/587,971	TSUBOI ET AL.	
	Examiner	Art Unit	
	Carlos Perromat	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 1/12/2010 have been fully considered but they are not persuasive. Starting at page 5, the Applicant argues that new claim limitations that restrict the predetermined condition to **information regarding** an optical wavefront control unit **and** a condition restricting a region to be calculated of a three-dimensional image of each pixel of a control image recorded in the optical wavefront control unit are not found within the prior art indicated in the previous rejection. The Applicant sustains that Yoshikawa does not teach the limitation of restricting a region to be calculated of the three-dimensional image. The Examiner agrees, since Yoshikawa is only called in the rejection for taking into account the characteristics of the optical control medium. The Applicant presents no argument against this teaching in Yoshikawa. The Examiner further notes that the combination of AAPA and Yoshikawa, therefore teaches that the control image satisfies a condition, where the condition is information regarding an optical wavefront unit (the characteristics of the optical control medium taken into account in Yoshikawa).

The Applicant further provides a description of the Applicant's understanding of the teachings in Payne, at page 7, in which the Applicant states that Payne merely teaches positioning exit pupils, which does not require moving parts in the system. The Examiner disagrees, and respectfully maintains that the Applicant has performed only a partial analysis of the teachings in Payne. In fact, at par. [0093] Payne teaches achieving additional computational savings by limiting the range angles that each

holographic element is required to direct light into for a given viewer position, par. [0093]. This teaching in Payne seems to not have been considered by the Applicant, and is interpreted by the Examiner as teaching a restriction of a region to be calculated of a three-dimensional image of each pixel of the image generating unit, thereby meeting the scope of the added limitation.

Finally, the Applicant declares in a footnote at the end of page 5 that there is no statement in the specification that identifies the section of the disclosure identified by the Examiner as prior art. The Examiner however notes that page 3, lines 6 and 7, 12 and 23 describe the contents relied upon as conventional in the art at the time of Application, and therefore, by the Applicant's own description, prior art admitted by the Applicant, since the techniques illustrated were widely known. Further, the Examiner notes that even if the Applicant were to make the argument that even though the contents described are conventional, that they are the result of the work by the inventors, the Examiner points out that the Applicant claims priority to a PCT Application and further to two Japanese applications, and the Applicant states that the invention has been made in view of the problems of the conventional techniques (see page 4, lines 5-10), which were necessarily known as of the date of the invention and subsequently prior to the Japanese applications for which the Applicant claims priority, and therefore, the cited portions of the disclosure describe techniques conventionally known in the art at least prior to 2/9/2004, and therefore known in the art at least a year prior to the Applicant's effective filing date in the U.S. Further, a comment by the Applicant that the cited portion is not explicitly addressed as prior art is not equivalent to a statement by

the Applicant that the cited sections are not prior art. The Examiner considers the entire background section as Applicant admitted prior art, except for the statements by the Applicant recognizing problems within the conventional techniques, which would have not been necessarily known to those using the conventional techniques disclosed.

Remarks

The Examiner notes that the Applicant intends complex subject matter disclosed to be claimed by very broad terminology, resulting in the claims being rejected as unpatentable over prior art that meets the claim limitations as reasonably interpreted in light of the disclosure. The Applicant is advised to incorporate limitations to the independent claims that will restrict the scope of the claim invention, particularly by adding details absent in the claims regarding the characteristics of the information regarding the optical wavefront control unit and of how the region of the three-dimensional image of each pixel of a control image is calculated. Such limitations would differentiate the invention with respect to the indicated prior art.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (p.1, lines 14-29, p.2, lines 1-29, p.3, lines 1-29 and p. 4, lines 1-10 of the specification of the instant application; "AAPA" hereinafter) in view of

Yoshikawa et al. (N. Yoshikawa and T. Yatagai; "Phase Optimization of a Kinoform by Simulated Annealing"; Applied Optics, Vol. 33, No. 5; February 1994; supplied by the applicant; "Yoshikawa" hereinafter), and further in view of Payne et al. (U.S. patent Publication No. 2004/0021768; "Payne" hereinafter).

Regarding claim 1, AAPA teaches a three-dimensional image display device for displaying a three-dimensional image by irradiating illuminating light at an optical wavefront control unit which records a control image (p. 1, lines 1-20), comprising: a control image optimizing unit configured to calculate three-dimensional images corresponding to a group of control images, select a control image corresponding to the three-dimensional image satisfying a predetermined condition from the group of control images, and record the selected control image on the optical wavefront control unit (see p. 2, lines 2-29 and p. 3, lines 1-4 for a thorough description of the Simulated Annealing method which consists on the steps described).

AAPA does not teach that the group of control images is based on constraints inherent to the optical wavefront unit. Yoshikawa however discloses a method of optimizing phase of a kinoform using a Simulated Annealing method such as that described in AAPA (see Introduction, 2nd and 3rd par. for Simulated Annealing) where the kinoform is optimized to adjust to the characteristics of the optical control medium (see Introduction, 3rd par.; see Section 4, 3rd par. for using the modulation characteristics of the control unit in order to improve irregularities obtained when this characteristic is not considered). Because both AAPA and Yoshikawa teach devices that optimized a kinoform using the Simulated Annealing method, it would have been

obvious to one of ordinary skill in the art at the time of the invention to use the display characteristics of the display unit when performing Simulated Annealing optimization for the reasons disclosed by Yoshikawa and discussed above.

AAPA and Yoshikawa further teach that the predetermined condition is information regarding an optical wavefront control unit (see discussion above for using the modulation characteristics of the control unit). AAPA and Yoshikawa do not explicitly teach the predetermined condition is also a condition restricting a region to be calculated of a three-dimensional image of each pixel of a control image recorded in the optical wavefront control unit.

Payne however teaches a three-dimensional display in which calculations are minimized by taking into account only the range of angles that cause an effect (see abstract; see par. [0033]; see par. [0093] for using this limitation in calculation by determining the originating elements in the control device that affect a region and further speeding calculations by limiting the range of angles that each holographic element is required to direct light into). Since Payne teaches reducing calculations by processing only data relevant to an appropriate output region, and AAPA teaches the computational intensity of the Simulated Annealing method (see p. 2, line 29 and p.3 lines 1-5), it would have been obvious to one of ordinary skill in the art to use the association of control elements and output region taught in Payne with the Simulated Annealing method taught in AAPA and Yoshikawa in order to reduce calculations to the portions of the image affected by each iterative change, as taught by Payne.

Regarding claim 2, AAPA and Yoshikawa further teach that the control image optimizing unit is configured to generate the group of control images by sequentially performing change processing on part of the control image, and sequentially calculate the three-dimensional images based on difference information about the control images before and after the change processing (in AAPA, see p. 2, lines 2-5 and p. 3, lines 1-5).

Regarding claim 3, AAPA and Yoshikawa do not explicitly disclose that the control image optimizing unit is configured to calculate the three-dimensional image in a region to be calculated defined by the constraints. Payne however teaches a three-dimensional display in which calculations are minimized by taking into account only the range of angles that cause an effect (see abstract; see par. [0033]; see par. [0093] for using this limitation in calculation by determining the originating elements in the control device that affect a region). Since Payne teaches reducing calculations by processing only data relevant to an appropriate output region, and AAPA teaches the computational intensity of the Simulated Annealing method (see p. 2, line 29 and p.3 lines 1-5), it would have been obvious to one of ordinary skill in the art to use the association of control elements and output region taught in Payne with the Simulated Annealing method taught in AAPA and Yoshikawa in order to reduce calculations to the portions of the image affected by each iterative change, as taught by Payne.

Regarding claim 4, AAPA, Yoshikawa and Payne further teach that the control image is constituted by phase distribution of an optical wavefront (in AAPA, see p. 1, lines 21-26); and the control image optimizing unit is configured to calculate the region

to be calculated, based on a range in which phase modulation is possible on a display device constituting the optical wavefront control unit, and accuracy of the phase modulation (see discussion for claims 1, 2 and 3 above; in Yoshikawa, see Fig. 7 for the phase modulation and discussion above to account for this effect).

Regarding claim 5, AAPA, Yoshikawa and Payne further teach that the control image optimizing unit is configured to calculate the region to be calculated, also taking account of amplitude modulation which occurs with the phase modulation (see discussion for claims 1, 2 and 3 above; in Yoshikawa, see Fig. 7 for amplitude modulation, and discussion above to account for this effect).

Regarding claim 6, AAPA, Yoshikawa and Payne further teach that the control image is constituted by amplitude distribution of an optical wavefront; and the control image optimizing unit is configured to calculate the region to be calculated based on a range in which amplitude modulation is possible on a display device constituting the optical wavefront control unit, and accuracy of the amplitude modulation (see discussion for claims 1, 2 and 3 above; in AAPA; see p. 1, lines 14-20 for controlling either phase or amplitude distribution. Although the Simulated Annealing method is discussed with respect to phase distribution the Examiner notes that the method only describes a pseudo-random optimization method to solve computationally difficult problems by using progressively narrow tolerances, and that it would have been obvious to one of ordinary skill in the art at the time of the invention to use such method to adjust amplitude in the same manner as adjusting phase; Yoshikawa, see Fig. 7, for amplitude and phase modulation).

Regarding claim 7, AAPA, Yoshikawa and Payne further teach that the control image optimizing unit is configured to calculate the region to be calculated also taking account of phase modulation which occurs with the amplitude modulation (see discussion for claims 1, 2 and 3; in Yoshikawa, see Fig. 7 for amplitude and phase modulation).

Regarding claim 8, AAPA, Yoshikawa and Payne teach a three-dimensional image display method for displaying a three-dimensional image by irradiating illuminating light at an optical wavefront control unit which records a control image comprising the steps of: calculating three-dimensional images corresponding to a group of control images based on constraints inherent to the optical wavefront control unit; selecting a control image corresponding to the three-dimensional image satisfying a predetermined condition from the group of control images; and displaying the selected control image on the optical wavefront control unit, wherein the predetermined condition is information regarding an optical wavefront control unit and a condition restricting a region to be calculated of a three-dimensional image of each pixel of a control image recorded in the optical wavefront control unit (see discussion for claim 1, above).

Regarding claim 9, AAPA, Yoshikawa and Payne further teach that the region to be calculated defined by the constraints is calculated is calculated for each pixel of an initial solution (see discussion for claim 1 for AAPA teaching simulated annealing as conventional, see AAPA page 2, lines 2-29 and page 3, lines 1-5; see discussion above for taking into account the modulation capabilities of the control unit, and see Payne,

par. [0093] for speeding up calculations by using the limited angle ranges for each holographic element for speeding up calculations).

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carlos Perromat whose telephone number is (571) 270-7174. The examiner can normally be reached on M-TH 8:30 am- 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee M. Tung can be reached on (571)272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kee M Tung/
Supervisory Patent Examiner, Art Unit 2628

/Carlos Perromat/
Examiner
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C.P.